भारतीय मानक
Indian Standard

IS 17291 : 2019

वस्त्रादि — अस्थायी संरचनाओं के लिए जूट आधारित अग्नि अवरोधक सजावटी एवं आच्छादन कपडें — विशिष्टि

Textiles — Flame Retardant Jute Based Decorative and Cover Fabric for Temporary Structure — Specification

ICS 13.220.40; 59.080.30

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भारतीय मानक ब्यूरो
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Textiles Protective Clothing Sectional Committee, TXD 32

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Textiles Protective Clothing Sectional Committee had been approved by the Textile Division Council.

With advent of different variety of jute based wall cover and decorative fabrics after diversification of jute and jute based other products, it is felt essential to develop separate fire retardant standard for jute based cover fabrics for temporary structure including conventional jute cover fabrics, jute based finer variety of decorative and furnishing fabrics and jute-cotton union fabrics, tent/wall cover fabrics and jute based pandal fabrics for temporary structure etc. For protection against fire retardant, performance of such jute based fabrics need to be enhanced and tested.

Ministry of Textiles, Government of India, through Jute Commissioner's office, Government of India has entrusted Department of Jute and Fibre Technology (DJFT), Institute of Jute Technology (IJT), University of Calcutta (CU) for doing necessary R and D to develop performance effective fire retardant finish of jute and to establish a new standard for fire retardant jute based cover fabric and decorative fabric for temporary structure and other diversified end uses. As these jute based fabrics does not demand or does not require frequent washing and hence, requirement of very high degree of washing fastness for such jute based fire retardant fabric is not felt essential. But considering the end uses as cover fabric and decorative home textiles for temporary structure, it has become essential to find a semi-durable to moderately durable fire retardant formulation for jute with some degree of wash durability up to 5 wash cycles for different fire retardant formulations to be applied on jute.

Fire protective finish by different fire retardant agents for cotton and synthetics has been reported during last few decades by many researchers in literature and Indian Standard for the same has been published. But there are scanty reports on fire retardant finish for jute fabrics. The major problems associated with fire retardant finishing treatment of jute are higher chemical add-on, noticeable loss in tensile strength and yellowing etc. besides to achieve suitable fire retardant performances unlike cotton and synthetic fabrics. Moreover, most of such fire retardant formulations requires high dosages of relevant chemicals and are semi durable in nature. Hence by prolong R & D for two years, DJFT, CU has developed both semi durable as well as wash fast fire retardant formulations for jute fabrics with a field trail at Ambica Jute Mills, Belur, Howrah. Testing of these fire retardant jute fabrics have been carried out at DJFT, IJT, CU and also inter-lab test trial have been done at Northern India Textile Research Association (NITRA), Ghaziabad, as COE in protective textiles for authentication and confirmation of test results from an outside lab. Few examples for application procedure of fire retardant treatments is given in Annex C for guidance only.

The composition of the Committee responsible for the formulation of this standard is given in Annex D.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

TEXTILES — FLAME RETARDANT JUTE BASED DECORATIVE AND COVER FABRIC FOR TEMPORARY STRUCTURE — SPECIFICATION

1 SCOPE

This standard prescribes constructional, performance and other requirements for flame retardant jute based decorative and cover fabrics for temporary structures. These jute or jute-cotton union fabrics (natural-grey, bleached and dyed or printed jute based fabrics) are usually used for wall decoration, cover and decoration purpose in temporary structure (pandal) and also in other semi-permanent structure like temporary tent etc.

2 REFERENCES

The standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards.

3 TERMINOLOGY

For the purpose of this standard, definitions given in IS 11871 shall apply.

4 MATERIALS

4.1 Fabric

4.1.1 *Construction*

The basic plain woven bleached jute fabric shall be flame retardant. The construction of jute based furnishing fabric may be either hessian or canvas type as per IS 2818 or IS 10036 (Part 1 and 2) or jute-cotton union fabrics with plain weave. Jute/cotton (J/C) union furnishing fabric shall be desired scoured and 2 percent hydrogen peroxide (H_2O_2) bleached. Jute/cotton (J/C) union furnishing fabric shall be manufactured from 42 tex cotton yarn as warp and 185 tex jute yarn as weft having 80 ends/dm (minimum) and 70 picks/dm (minimum). The minimum fabric mass and thickness shall be 280 g/m^2 and 0.70 mm respectively. Jute/cotton union fabric shall have 75 ± 3 percent jute weft yarn and 25 ± 3 percent cotton warp yarn by weight or as specified and mutually agreed between buyer and seller.

NOTE — The count of the cotton and jute yarn has been given for guidance only.

5 REQUIREMENTS

The FR jute fabric or jute/cotton union fabric shall meet the requirements specified in **5.1** to **5.11**.

5.1 Breaking Load

The breaking load of FR jute fabric or jute/cotton union fabric for warpway and weftway shall not be less than 40 kgf and 20 kgf respectively when tested in accordance with IS 1969 (Part 1) on a specimen of 5 cm width.

5.2 Tear Strength

The tear strength for warpway and weftway directions of the FR jute fabric or jute/cotton union fabric shall not be less than 15 N when tested in accordance with the IS 6489 (Part 1).

5.3 Dimensional Change on Soaking

The dimensional change on soaking in warpway and weftway direction of the FR jute fabric or jute/cotton union fabric shall be 2 percent maximum when tested in accordance with the IS 2977.

5.4 *p*H Value

*p*H value of the aqueous extract of FR jute fabric or jute/cotton union fabric shall be 4.0 to 9.0 when tested as per the method specified in IS 1390 (cold method).

5.5 Residual Formaldehyde

Residual formaldehyde shall not exceed 300 ppm (300 mg/kg) when tested as per the method specified in IS 14563 (Part 1).

5.6 Flame Resistance Performance Requirements

FR jute fabric or jute/cotton union fabric shall meet the flammability requirements as specified below when tested in accordance with method A of IS 11871:

a) *Duration of Flame* — No test specimen shall continue to flame for more than 12 s after the igniting flame is removed.

b) *After Glow* — After glow time shall not be more than 12 s.

c) *Char Length* — No test specimen shall have char length more that 40 mm. There shall be no melting and dripping under the influence of flame.

5.7 Toxicity Index

The toxicity index of gases evolved during burning of 100 g of FR jute fabric or jute/cotton union fabric shall be 1.5 *Max.* when tested by the method prescribed in Annex D of IS 15741.

NOTE — This requirement is to be tested on the FR jute fabric or jute/cotton union fabric as delivered by the supplier before any washing.

5.8 Visibility Due to Smoke Released on Combustion

The visibility due to smoke released on combustion of FR jute fabric or jute/cotton union fabric shall conform to either class A or class B when tested by the method specified in IS 15782.

NOTE — This requirement is to be tested on the FR jute fabric or jute/cotton union fabric as delivered by the supplier before any washing.

5.9 Limited Oxygen Index (LOI)

FR jute fabric or jute/cotton union fabric shall have the LOI value of at least 32 for the treated fabric before washing or dry cleaning and at least 30 after 5 wash cycle or 10 dry cleaning cycles when tested as per method given in IS 13501.

5.10 Resistance to Spread of Flame

FR jute fabric or jute/cotton union fabric shall meet the requirement for flame spread of class 1 as specified in IS 15612 (Part 1).

5.11 Durability of Fire Retardant Property

The FR jute fabric or jute/cotton union fabric shall conform to the requirements as specified in **5.6**, **5.9** and **5.10** after 5 washing cycles or 10 dry cleaning cycles. The washing and dry cleaning shall be carried out by the method specified in Annex B.

NOTE — As jute fabrics/ FR jute fabrics are seldom washed, FR performance up to 5 cycles of wash has been considered as satisfactory.

6 PACKING AND MARKING

6.1 Packing

The fabrics shall be packed in polythene packets unless otherwise agreed to between the purchaser and the supplier.

6.2 Marking

6.2.1 The fabrics shall be marked with the following:

a) Length and width of the material;
b) Mass of the fire retardant jute or jute-cotton union fabric;
c) The wording ‘flame retardant jute or jute-cotton union fabric’;
d) Indication of the source of manufacture/ manufacture’s name or trade mark, if any;
e) Batch number; and
f) Date of manufacture (month and year).

6.2.2 *BIS Certification Marking*

The FR jute fabric or jute/cotton union fabric conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the FR jute fabric or jute/cotton union fabric may be marked with the Standard Mark.

7 SAMPLING AND CRITERIA FOR CONFORMITY

7.1 Lot

All the flame retardant jute or jute-cotton union fabric of the same size, style and made from the same material and produced under similar conditions of manufacture shall constitute a lot.

7.1.1 All the lots shall be tested separately for testing the conformity of the lot to the requirements of the standard.

7.2 The number of samples to be drawn shall depend upon the size of the lot and shall be as per Table 1. The samples shall be selected at random in accordance with IS 4905.

Table 1 Scale of Sampling

(*Clause* 7.2)

Sl No.	Lot Size	Sample Size	Sub-sample Size
(1)	(2)	(3)	(4)
i)	2 – 8	2	2
ii)	9 – 15	3	2
iii)	16 – 25	5	3
iv)	26 – 50	8	3
v)	51 – 100	13	5
vi)	101 – 150	20	5
vii)	151 – 300	32	8
viii)	301 – 500	50	8
ix)	501 – 1 000	80	13
x)	1 001 – 3 000	125	13
xi)	3 001 and above	200	10

7.3 Number of Test Samples and Criteria for Conformity

The number of test samples and the criterion for conformity for various characteristics shall be as given in Table 2.

Table 2 Criterion for conformity

(*Clause* 7.3)

Sl No. (1)	Characteristic (2)	Number of Test Samples (3)	Criteria for Conformity (4)
i)	Construction, breaking load, tear strength, dimensional change on soaking, *p*H value and residual formaldehyde	All the sample selected according to the column 3 of Table 1	All the sample shall pass the tests
ii)	All other requirements	All the sample selected according to the column 4 of Table 1	All the sample shall pass the tests

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
1390 : 1983	Methods for determination of *p*H value of aqueous extracts of textile materials (*first revision*)
1969 (Part 1) : 2018	Textiles — Tensile properties of fabrics: Part 1 Determination of maximum force and elongation at maximum force using the strip method (*fourth revision*)
2818 : 2015	Textiles — Hessian — Specification (*third revision*)
2977 : 1989	Fabrics (other than wool) — Method for determination of dimensional changes on soaking in water (*first revision*)
4905 : 2015	Random sampling and randomization procedures (*first revision*)
6489 : (Part 1) : 2011	Textiles — Tear properties of fabrics: Part 1 Determination of tear force using ballistic pendulum method (Elmendorf) (*second revision*)
10036 (Part 1 and 2) : 1982	Specification for jute canvas
11871 : 1986	Methods for determination of flammability and flame resistance of textile fabrics
13501 : 1992	Textiles — Determination of flammability by oxygen index
14563 (Part 1) : 1998	Textiles — Determination of formaldehyde: Part 1 Free formaldehyde
15370 : 2005	Textiles — Domestic washing and drying procedures for textile testing
15612 (Part 2) : 2006	Textiles — Burning behaviour of curtains and drapes: Part 2 Measurement of flame spread of vertically oriented specimens with large ignition source
15741 : 2007	Textiles — Resistance to ignition of curtains and drapes — Specification
15782 : 2008	Textiles — Method for determining deterioration of visibility due to smoke released on combustion of materials

ANNEX B

(*Clause* 5.11)

WASHING AND DRY CLEANING PROCEDURE

B-1 WASHING TREATMENT

B-1.1 Apparatus

Type A washer — Front loading, horizontal drum type as specified in **5** of IS 15370.

B-1.2 Reagents

Detergent — Non phosphate ECE reference detergent A (without optical brightener) (*see* **4** of IS 15370).

B-1.3 Washing Procedure

Type A washer shall be used. Washing procedure 6A as specified in **7**, Table 1 of IS 15370 shall be used.

B-1.4 Drying Procedure

Procedure C — Flat dry shall be employed for drying of fabric as specified in **8.3** of IS 15370.

B-2 DRY CLEANING TREATMENT

B-2.1 Reagent

B-2.1.1 *Tetrachloroehtane,* $CCl_2 = CCl_2$ distilled, sold for the purpose of dry cleaning.

B-2.1.2 *Sorbitan Mono-Oleate*

NOTE — In order to prevent foaming, it is important to use redistilled, clean solvent solution and not overfill the still.

B-2.2 Apparatus

Dry cleaning machine, consisting of a commercial reversible rotating cage type as specified in **C-2** of Annex C of IS 15612 (Part 2).

B-2.3 Procedure

Procedure for normal materials (Table 1) as specified in **C-3.1** of Annex C of IS 15612 (Part 2) shall be used.

NOTE — Dry cleaning and washing cylinder may be used instead of dry cleaning machine as per the agreement between the buyer and the seller.

ANNEX C

(*Foreword*)

EXAMPLE FOR APPLICATION PROCEDURE OF FIRE RETARDANT TREATMENTS

C- 1 EXAMPLE 1

C-1.1 Process Flow Chart for the Semi-Durable Fire Retardant Finish Sulfamate Based Recipe

Preparation of 20 percent urea and 15 percent ammonium sulfamate Solution

↓

Padding mangle trough is set with prepared urea and sulfamate solution

↓

Fabric is padded with 20 percent urea solution and 15 percent ammonium sulfamate solution in padding mangle (2 dip and 2 nip with 1 005 expression)

↓

The padded jute fabric is then dried in CDR at 100 degree celsius

↓

The dried jute fabric is then cured in curing chamber at 140 degree celsius for 5 mins

C-2 EXAMPLE 2

C-2.1 Process Flow Chart for the Semi-Durable Fire Retardant Finish Phosphate Based Recipe

Preparation of 15 percent urea and 10 percent DAP solutionAmmonium Sulfamate Solution

↓

Padding mangle trought is set with prepared urea and phosphate solution

↓

Fabric is padded with 15 percent urea and 10 percent DAP solution in padding mangle (2 dip and nip with 100 percent expression)

↓

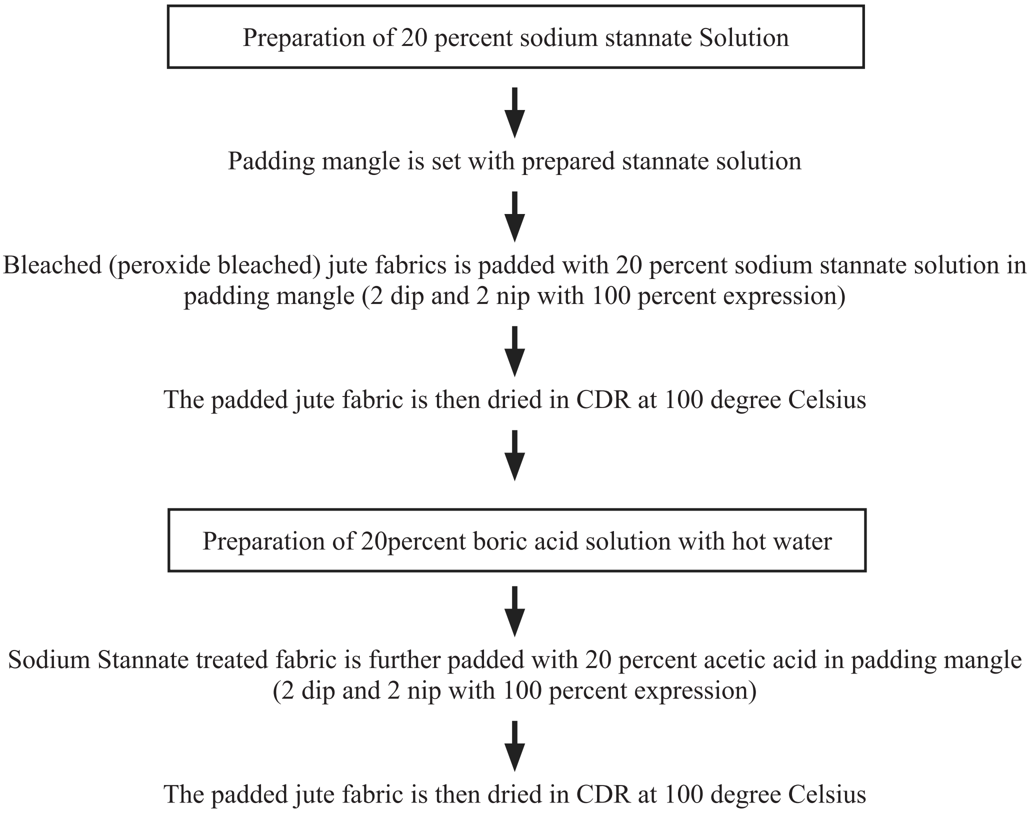
The padded jute fabric is then dried in CDR at 100 degree celsius

↓

The dried jute fabric is then cured is curing chamber at 140 degree celsius for 5 mins

C-3 EXAMPLE 3

C-3.1 Process Flow Chart for the Durable Fire Retardant Finish Stannate Based Recipe



Preparation of 20 percent sodium stannate Solution

Padding mangle is set with prepared stannate solution

Bleached (peroxide bleached) jute fabrics is padded with 20 percent sodium stannate solution in padding mangle (2 dip and 2 nip with 100 percent expression)

The padded jute fabric is then dried in CDR at 100 degree Celsius

Preparation of 20percent boric acid solution with hot water

Sodium Stannate treated fabric is further padded with 20 percent acetic acid in padding mangle (2 dip and 2 nip with 100 percent expression)

The padded jute fabric is then dried in CDR at 100 degree Celsius

C-4 EXAMPLE 4

C-4.1 Particles Preparation of Nano Zinc Oxide (ZnO)

The zinc acetate dehydrate, sodium hydroxide, was purchased from Loba chemicals. ZnO nano powder was prepared by co-precipitation method. 50 g of zinc acetate dihydrate was put into 1 000 ml of distilled water under vigorous stirring. After 10 min stirring, 2 M NaOH aqueous solution was introduced into the above aqueous solution, resulting in a slurry like white solution, which were then placed on magnetic stirrer for stirring for 2 h. The precipitate was then taken out and washed repeatedly with distilled water followed by ethanol to remove the impurities for the final products. Then a white powder was obtained after drying at 100°C in vacuum oven for 6 h. The white precipitate is then calcinated at 600°C for 4 h in muffle furnace in order to get purified Zn nano powder.

C-4.2 Application of ZnO Nano Particles

0.1gm ZnO Nano powder was weighed and made dispersion with 50 ml BS16. Distilled water is added in this and the solution is made up to 500 ml. Out of this, 250 ml is taken out in a tray and the bleached jute fabric is kept for 30 min. Then the fabric is padded through the padding mangle with the pressure of 20 kg/cm^2 .The fabric is then taken out and dried at 90°C.

ANNEX D

(*Foreword*)

COMMITTEE COMPOSITION

Textiles Protective Clothing Sectional Committee, TXD 32

Organization	*Representative(s)*
Northern India Textile Research Association, Ghaziabad	Dr Arindam Basu (***Chairman***) Dr M. S. Parmar (*Alternate*)
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